Other modes of ventilation on the Hamilton-T1 Ventilator

Pressure-controlled SMIV (PSIMV +)

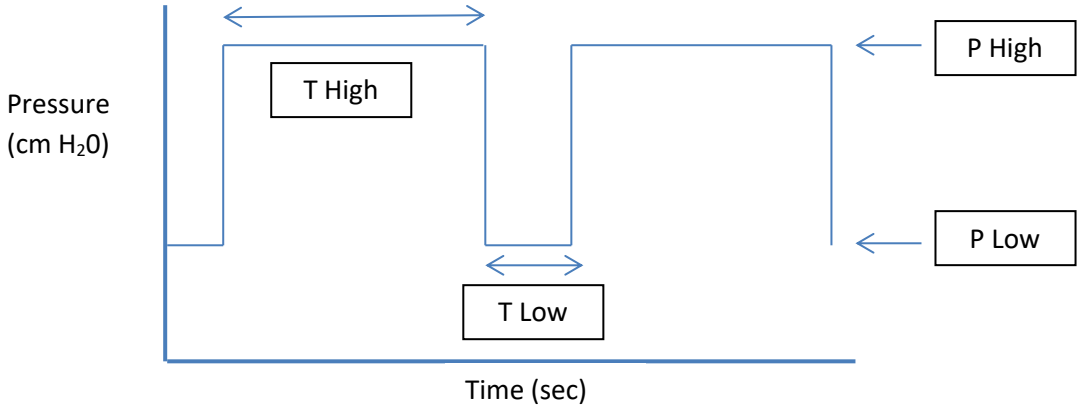
- Delivers pressure-controlled, time-cycled mandatory breaths and pressure-supported, flow-cycled spontaneous breaths
- Delivers a pre-set pressure but does not guarantee a fixed tidal volume
- **No advantage over PCV+ in the absence of spontaneous breathing – discuss use with KIDS consultant**

Duo Positive Airway Pressure mode (DuoPAP)

- Primarily designed to support spontaneous breathing
- In this mode, the ventilator switches automatically and regularly between two levels of CPAP ('P high') and 'PEEP', determined by the operator
- The patient may breath freely at either level, with the option to add pressure support to these spontaneous breaths
- The switchover between the two levels is defined by 'T high' (time spent at the higher level of CPAP) and rate
- **No advantage over PCV+ in the absence of spontaneous breathing – discuss use with KIDS consultant**

Airway Pressure Release Ventilation (APRV)

- Applies CPAP ('P High') for a prolonged time ('T High') to maintain recruitment of alveoli
- Reduces the pressure to a lower set value ('P Low') for a short period of time ('T low') to allow clearance of CO_2



APRV continued…

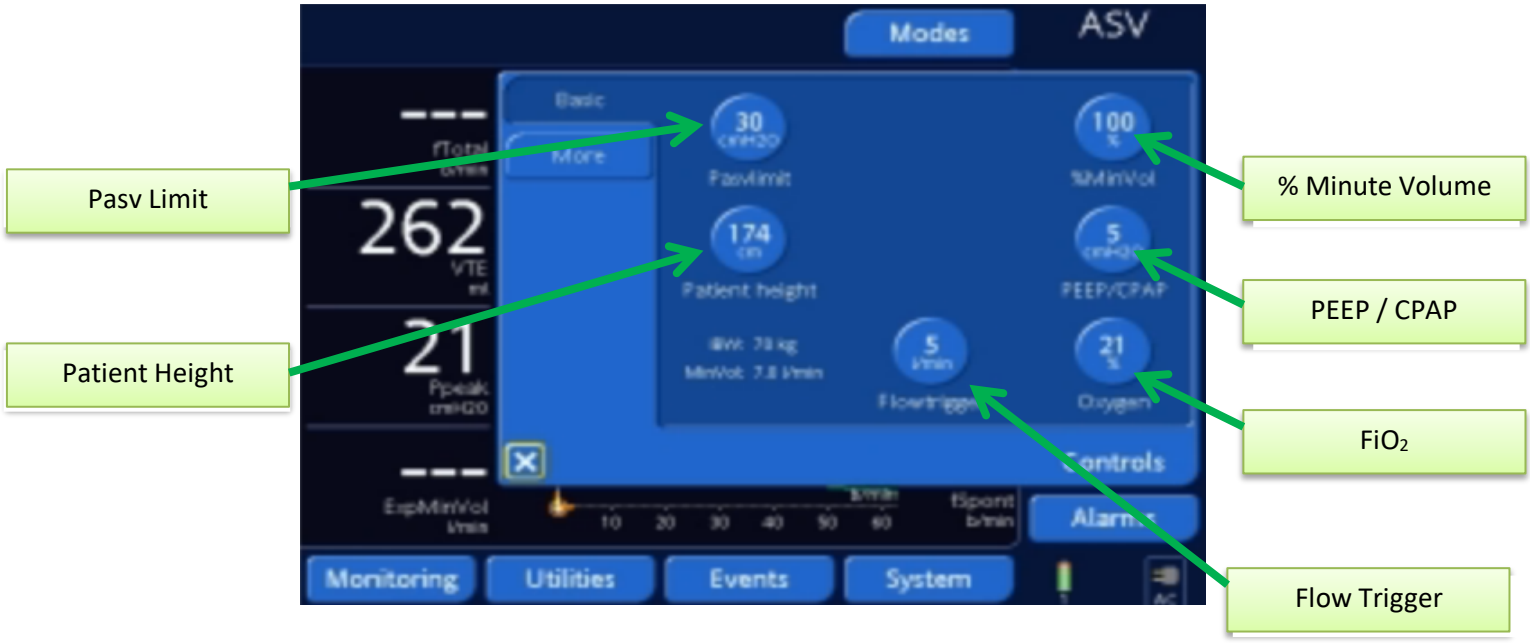
Potentially useful in ARDS / Acute Lung Injury, however **use of APRV should be discussed with the on-call KIDS consultant prior to initiation**

Suggested settings for initiating APRV (as per T1 user manual)

Ideal body Weight (Kg)	P high / P low (cmH20)	T high (sec)	T low (sec)
0.2 – 3	20 / 5	1.4	0
3 to 5	20 / 5	1.7	0.3
6 to 8	20 / 5	2.1	0.3
9 to 20	20 / 5	2.6	0.4
21 to 39	20 / 5	3.5	0.5
40 to 59	20 / 5	4.4	0.6
60 to 89	20 / 5	5.4	0.6
90 to 99	23/5	5.4	0.6
≥ 100	25/5	5.4	0.6

Adaptive Support Ventilation (ASV)

- ASV calculates the patients' required Minute Volume (= Tidal Volume x Respiratory Rate) based on their Ideal Body Weight (IBW). Settings in terms of tidal volume, respiratory rate and inspiratory time are determined **automatically** by the ventilator.
- In spontaneously breathing patients, pressure support breaths are delivered. If there is no patient effort, pressure control breaths are delivered.
- Adjustable settings in ASV mode are patient height (from which IBW is calculated), 'Percentage Minute Ventilation', 'Pasv limit' (both explained overleaf), PEEP, Flow Trigger and FiO_2. The control screen in ASV mode is shown here:-



% Minute Volume Example*

A 2 and a half year old boy has a height of 96cm. His IBW = 14 kgs.

Tidal volume at 6mls/kg = 84mls. Respiratory rate = 25 breaths /minute.

Minute ventilation ("100% Minute Ventilation") = Tidal Volume x Respiratory Rate = 84mls x 25 breaths/min = 2100mls or 2.1 litres

'120% MinVol' = 2100 x 120% = 2520mls or 2.52 litres etc.

**May not be the exact values/parameters used by the Hamilton T1 for this patient*

Adjusting % Minute Volume

100% Minute Volume is a reasonable starting point for most patients. Hamilton recommends starting at 120% if Body Temperature is > 38.5C or the patient has ARDS. For flights, an addition of 5% should be made for each 500metres (1640ft) above sea level. Adjustments can be made as follows (as per the T1 user manual):

Condition	%MinVol Change	Remarks
Normal arterial blood gases	None	--
High $PaCO_2$	Increase %MinVol	Pay attention to inspiratory pressures
Low $PaCO_2$	Decrease %MinVol	Pay attention to mean pressures and oxygenation status
Low O_2 saturation	None	Consider increase in PEEP or FiO_2

Pasv limit

- ASV regulates the inspiratory pressure to achieve the target tidal volume. To avoid an excessive inspiratory pressure, it is important to set the "ASV pressure limit".
- The ASV pressure limit is linked to the setting of the high airway pressure alarm: **the Pasvlimit is always 10 cmH2O below the set high pressure alarm limit**. For instance, if the upper pressure alarm limit is set to 45 cmH2O, the Pasvlimit corresponds to 35 cmH2O. Both the alarm and Pasvlimit settings are displayed graphically on the screen of the T1 as shown below.